

IMPROVEMENT OF THE DIETS OF ELEMENTARY AND SECONDARY SCHOOL
CHILDREN THROUGH NUTRITION EDUCATION
AND THE SCHOOL LUNCH PROGRAM

by

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INTRODUCTION

Observations made during three years of teaching in the Damar consolidated school, Rooks County, Kansas indicated that the general dietary pattern of the community was poor. Breakfast was often omitted by many of the school children or if they did eat at that time it was frequently a poorly balanced meal. Many diets were inadequate in milk, fruit, and vegetables.

Milk consumption with the school lunch had been especially low among the secondary school pupils; thus, the group was not eating a type A lunch as served. Milk served with the school lunch makes a beneficial contribution to the daily nutritive requirements. A low daily intake of fruits and vegetables indicated the possibility of inadequate amounts of vitamins A and C and also some of the minerals.

The awareness of the necessity of good eating habits was not entirely foreign to the mothers since a number of them were active members of the Home Demonstration Unit. The children were naturally interested in scientific material and experiments because many fed their livestock good rations in order to win 4-H prizes. These attitudes of the parents and children could be used profitably in a nutrition education program. A school lunch program which provided the children with well-balanced meals should increase their acceptance of such foods as fresh fruits and vegetables.

The purpose of this study was, therefore, to improve the diets of the elementary and secondary school children through

nutrition education and the school lunch program.

REVIEW OF LITERATURE

School Lunch

According to Dr. Willa Vaughn Tinsley (1951b), the school lunch has two basic purposes: (1) it should be an adequate, well planned, properly cooked and attractively served meal, or it should supplement the packed lunch brought from home; (2) the school lunchroom atmosphere should be such as to develop and maintain good eating and social habits. Pauline Barry Mack of Pennsylvania, in an article by Lamb (1950), stated that "the mere act of providing a school lunch is of small benefit unless the lunch is planned carefully by those who are trained in nutrition and dietetics and are familiar with the home dietaries of the children". Dr. Mack listed the chief reasons for poor school lunches:

1. Unskilled and untrained persons are in charge of planning and preparation. The nutrients supplied by such lunches are actually less than would have been obtained by lunches supplied at home.
2. Those at home paid less attention to home dietaries because of confidence in the child feeding program.

An aid to successful planning of school lunch menus that will supply the child with at least one-third of his daily dietary needs is the standardized recipe for which Kavanaugh (1952) gave four basic points to be considered. The recipe "must be acceptable to the patron's taste, must be nutritionally adequate and

whenever possible incorporate the greatest amount of nutritional value in excess of the requirement, must be practical to prepare and serve, and must come within the food cost allowance".

According to Cooper and Bryan (1951), a type A lunch may furnish approximately one-third of the day's requirement for children 10 to 12 years of age if the menus are well planned. They stated that this standard must be increased for all children above 12 years of age. These same workers also maintained that the nutritional development of the growing child is a responsibility that rests upon both the parents and the school.

In a study of school lunches being served by nine schools, Dreisbach (1947) noted that less than one-third of the daily allowance for many of the nutrients was being furnished. Nutrients most often deficient in school lunches, ranked by number of schools where the lunch was deficient, are listed below:

Nutrient furnished by school lunch in amounts less than one-third of NRC Recommended Allowance	Number of schools having lunch deficient in nutrients
Vitamin C	8
Calcium	6
Thiamine	5
Energy	4
Minerals and Vitamin A	4 to 6
Protein	1

Dreisbach found that the cost of the meals had no relation to the nutritional value. On the other hand, Augustine et al. (1950)

stated there seemed to be a direct relationship between the cost of the lunch and nutritional adequacy. Her study indicated that menus which cost more per plate did not necessarily furnish adequate amounts of all nutrients; on the other hand she showed that menus which were low in cost could furnish adequate amounts of all nutrients--her point being that cost is not a criterion for measuring nutritional adequacy. Noticeable deficiencies in nutritional adequacy of the lunches for the three grade groups, namely, one to three, four to six, and seven to 12, indicated that greater consideration must be given to quantities of food served. Grades one to three were served first and had the fewest deficiencies and grades seven to 12, served last, had the greatest deficiencies. Portions should be standardized for various age groups in relation to their respective needs.

A three year study involving school lunches was conducted by the Bureau of Human Nutrition and Home Economics (Hathaway et al. 1950). In this study seven localities were represented: the District of Columbia, Maryland, West Virginia, New Jersey, Iowa, Kansas, and Ohio. The workers studied the nutritive value of school lunches by analyzing the foods as served to fourth, fifth, and sixth grade children. To determine the nutrition of the children as affected by the school lunch, children in a Control school, which had no school lunch program, were compared with children in a Lunch school, which served a plate lunch at noon. The results of their study were as follows:

1. Menus within the standard lunch pattern differed considerably in the extent to which they furnished

certain important nutrients. The lunches, as served, frequently failed to meet one-third of the daily dietary allowances recommended by the National Research Council, particularly for ascorbic acid and thiamine.

2. Blood values for hemoglobin showed little relationship to school lunch participation, but blood values for ascorbic acid were higher for children receiving a school lunch than for comparable children without the lunch.

3. Children having school lunches had better diets than children not having them, especially with respect to calcium, ascorbic acid and vitamin A value.

Meyer et al. (1951) noted the contribution of milk as a beverage to type A lunches in these representative schools. In complete meals with milk the half-pint of whole milk contributed 25 per cent of the daily dietary allowances for energy, 30 per cent of those for protein, 60 per cent of those for calcium, 25 per cent of those for thiamine and 50 per cent of those for riboflavin.

Food Acceptance

Planning and serving is only one phase of measuring the nutritional adequacy of the school lunch. Whether or not the child accepts and eats the food is a most important part of the picture. Reasons given by Vail (1951) for foods in a school lunch not being accepted were teacher influence, that is, the teacher did not accept the food; one pupil swayed the group; there was prejudice against certain foods; some foods were considered food for animals or suitable only for the underprivileged; certain foods were unacceptable to some religious or national

groups; students were unacquainted with a food or its preparation; or the food did not fit into an established meal pattern. She stated that flavor and palatability of food played an influencing role in the acceptability of food. Dreisbach (1947) stated the reason some children refused to take milk with their lunch may have been due to difficulty in handling it. If the milk was set at each place every child drank it.

Kennedy (1952), in studying the food preferences of pre-army California boys, stated that the nutritional benefits of food and its economical use depended on actual consumption which in turn depended on preferences and palatability. She noted the food habits of individuals were determined by such factors as age, sex, national-racial grouping, economic status, geographical location and availability of food as influenced by processing and transportation. When the above factors had been taken into account, the items which had rated low in acceptability were then studied to determine reasons for their non-acceptance. These included emotional prejudices, physiological reactions to the food, poor cooking methods, flavor dislikes and unfamiliarity. Foods receiving the lowest ratings were collards, dandelion greens, kidney, turnip greens, parsnips, red snapper, rutabagas, kohlrabi, heart, turnip roots, buttermilk, kale, escarole and beet tops. She stated, "It is realized that this type of questionnaire tests attitudes toward foods, and many items may have been checked as 'disliked' which had never been tasted".

Baker and Ehlers (1949) listed nine factors affecting the acceptance of school lunch dishes by students in three types of

schools:

1. Rural, including elementary and high schools where cash reimbursement was received and a type A lunch with no choice of foods was served.
2. A suburban (population 8,000) junior and senior high school which was not reimbursed and where a free choice of lunch items was offered.
3. Urban (population 8,000) high school where reimbursement was received.

The factors were: competition among foods, appearance, location on counter, name of dish, frequency of service, cost, weather, previous experience with the food and teacher influence.

Augustine et al. (1950) found that among 245 children in grades one to 12 in a small rural school in Iowa, vegetables and salads were accepted less readily than other menu items; and there was 100 per cent acceptance of milk by individual grade groups more than half of the time and acceptance never fell below 90 per cent, except three times for grades seven to 12.

The food choices of Nebraska children studied by Leverton and Coggs (1951) indicated that there were many foods rich in essential nutrients which a great number of the children in the study were not "willing to eat often". They stated that if children selected food by preference alone there would be danger of serious nutritional deficiencies. Their results further substantiated the recognized need for "widening food preferences and decreasing food prejudices as a basis for improving the nutritional value of the customary food intakes and thus improving nutritional status".

Dietary Surveys

In making dietary surveys the Committee on Nutrition Surveys (Food and Nutrition Board, 1949) said that two aspects of the time period covered by a dietary survey seemed especially important. There was a difference in diets among seasons, and there was a day-by-day and week-by-week variability in diets quite apart from the seasonal change. Whether or not it was desirable to calculate a given nutrient in a diet depended on whether or not it was likely to be deficient and on the intercorrelation of nutrients.

To make dietary studies it is necessary to have some kind of a score card. Young and Musgrave (1951) made a study on the uses of dietary score cards in which they tried to evaluate by objective measuring the worth of thirty such cards. These workers stated that the "evaluation by score cards can be no better than the score card used or than the judgment of the user". Before the card is used for dietary evaluation it should be thoroughly pre-tested on the diets under consideration and the results compared to an evaluation based on calculated nutrients. One of the greatest stumbling blocks in dietary evaluation is that many foods make some small contributions. In single servings, such foods may not seem rich sources of nutrients, but when eaten in any quantity they become exceedingly important. This may be summed up nicely in the words of Young and Musgrave (1951) who stated that "the investigator needs to face squarely the limitations of his instrument, to know what they are, and to be sure that his readers are aware of them".

A study was made by Meredith et al. (1951) to determine the accuracy of the recall technique of dietary interview for children. This was a cooperative project between the Nutrition Service of the Maryland Department of Health, the School Lunch Program of Prince George County, Maryland, and the Nutrition Branch of the United States Public Health Service. Three nutritionists and one school lunch supervisor conducted the study which compared 94 children (48 boys and 46 girls) from nine to 18 years of age. The study covered three consecutive days with different groups participating each day. A record of the actual consumption and a record of recall was kept for one school lunch. Each child was given a tray card by a nutritionist. She kept half of the tray card which recorded the day's menu and the number of servings the child took. When the tray was returned the food remaining was deducted. Later another nutritionist who did not know the day's menu and had not eaten lunch at school that day interviewed the child to obtain the "recall" record. The recall and computed records agreed completely in only six of the 94 records. This may have been due partly to very strict judging. For example, perhaps three-fourths cup of applesauce was served and the child considered it as two-thirds cup. One kind of food was incorrectly identified on 12 records. Forty-seven per cent omitted one or more food items and 71 per cent underestimated quantities of food eaten.

Eppright et al. (1952) discussed some of the problems in collecting and interpreting dietary information and presented the results of preliminary studies which were made to help solve

them. They stated that in interpreting data the probability of seasonal influence in nutrient intake, particularly ascorbic acid, must be remembered. In initiating dietary studies they stressed that careful consideration must be given to the apparent characteristics of the population involved. Accuracy of results and the amount of work to be done may be reduced if preliminary investigations of sub-samples are made. Their studies indicated that in order to get a true picture of the food habits of a group of children the data from the dietary records must be interpreted in a variety of ways. These authors stated that "since the intake of milk, probably more than that of any other food, affects the nutritive quality of the diet, it is important to obtain a good estimate of the amount used".

Height-weight Records

Height-weight records taken at regular intervals can be used as a criterion for judging proper growth. The Grid technic (Wetzel, 1948) treats "the child as a distinct individual rather than a replica of some 'average' boy or girl". Good eating habits should be reflected in good overall growth which in turn is a demonstration of good overall health. Previous methods of determining the physical condition and growth of children provided no means of predicting what might reasonably be expected of the child's status in the future. A child, whose height-weight record is plotted at regular intervals on the Wetzel Grid, is treated as an individual, and any deviation from his normal growth can

immediately be observed and precautions taken to correct any defects.

Nutrition Education

Probably the most effective and practical tool for health teaching, if properly conducted, is the school lunchroom. Here the child is supplied with adequate food at a minimum cost and can be trained in the development of proper food habits which he will follow throughout life. In the school lunchroom many a child has made his first acquaintance with a good food combination or with nourishing foods not used at home, as was stated in a manual published by the Ohio Dietetic Association (1946).

Basnett and Patton (1953) listed nine implications for nutrition education:

1. Children should be taught to eat a greater variety of fruits and vegetables, especially of citrus fruit and green leafy and yellow vegetables.
2. Children should be encouraged to consume more milk.
3. Parents should be encouraged to offer children a wider variety of green and yellow vegetables and to set an example of food acceptance for their children to follow.
4. By careful planning and with adequate information as to foods needed, most parents in the study should be able to provide a nutritionally adequate diet, though in some cases the variety of foods might need to be limited due to income.
5. Children, parents, and teachers need more practical knowledge of dietary requirements.
6. School lunchrooms can be effective laboratories for health education and social experience.

7. School lunch managers and homemakers need to plan together so that nutrients needed during one day can be provided through the combined home and school meals.

8. Audio-visual aids, such as television, are important tools and should not be overlooked in nutrition education.

9. Although the home undoubtedly has the most influence and responsibility, an effective nutrition education program requires long-range cooperative planning by home, school and community based on group needs.

Lockhart and Whitehead (1952) and also Hollinger (1951) stated the necessity for nutrition education beginning with teachers. The former authors suggested the nutritionist consult with the principal on the need of nutrition education and perhaps the organizing of a school health council. This could be composed of representatives from various groups or organizations depending upon the location of the school and the extent of the need. The responsibility for teaching nutrition should rest upon the classroom teacher. If she is not trained to teach this then she should receive the training through extension courses, workshops, or from teachers in home economics, health and physical education, or biology and general science.

How to increase the use of milk was the most important nutritional problem noted by Eppright (1950) in a study of Iowa people of two age groups, namely, 17 to 19 and 46 to 58 years of age. Both men and women were included in these groups. Milk does not have a high appetite level; that is, people often crave flavors found in other foods and these cravings are not satisfied by the use of milk. She suggested that milk consumption might be increased through greater use of milk in prepared foods, and that vitamin C foods could be increased through two channels,

namely, fruit or fruit juices for breakfast and a greater use of salads. She emphasized these and a greater use of green and yellow vegetables as three points in a nutrition education program.

Occasionally mothers have been found to criticize any move made to help them correct their feeding habits. In a bulletin, "Teaching Families Good Nutrition" (Metropolitan Life Insurance Company, 1951), a wise suggestion which should be followed in such cases was first to compliment the diet's good points (there must be at least one) and once the mother's confidence was won and a friendship established then show her where improvement could be made. In working with the mothers, the Wheat Flour Institute (1953) emphasized that children will eat as their parents eat. Therefore, if children are to learn good eating habits then parents, particularly the mothers, must be taught to provide desirable food, have good food practices themselves, and make mealtime pleasant.

Both chicks and white rats have been used to teach children what an important factor food is for growth. Potgieter (1951) suggested the use of chicks, two on a good diet and two on a poor diet with growth curves plotted for both. She suggested that at the termination of the experiment the chicks could be taken home, grown to full size, and eaten by the family, thus having an economic as well as educational value. Many nutritionists prefer the white rat instead of the chick as an experimental animal. Rats are small, clean and easily handled and cared for. Their response to different foods is similar to the response of humans.

They have a relatively quick response to diet. Since their growth rate is 30 times faster than human growth, a rat eight weeks old may be compared to a child of about six years. In a circular published by Wheat Flour Institute (1953), reasons were given for this type of experiment being valuable. Such an experiment could stimulate children's interest in food and its contribution to health; it is an effective means of demonstrating nutrition principles effectively; and, like any scientific experiment, it should teach children how to think. The experiment should be carried out on a schoolwide basis having each group responsible for a definite part. The primary group (grades 1 to 3) might do no more than observe; the intermediate group (grades 4 to 6) may help care for the animals, correlating the results of the experiment with other school subjects as arithmetic, English, or art. The junior high group might take more responsibility by planning with the teacher as to the division of work, presenting results, or by helping others as well as themselves to change their food habits. The senior high group should have more emphasis put on the nutritional aspects of the experiment. Home economics classes might use the experiment to study the effect of different food combinations on growth and general health; biology classes could dissect the rats at the termination of the experiment to study the effects of good and poor diets upon internal body tissue.

It is important and necessary, according to Tinsley (1951a), to arouse parent interest before commencing parent education. If the needs of the children are made specific and understandable

then parent interest grows stronger. In another article Tinsley (1951b) suggested other things, such as: publishing the school lunch menus in the newspaper, explaining and having the parents and children use the Basic Seven chart, and becoming familiar with the community pattern of eating. She also stated that the home-making teacher might help by bringing about a better cooperation between school lunch managers, workers, and teachers and by integrating the school lunch with classroom teaching.

MATERIAL AND METHODS

Subjects

There were 184 children from grades one to 12 in the Damar consolidated school district, Rooks County, Kansas where a type A lunch was served according to the standards set up by the School Lunch Division of the State Board of Education. Of this number 11 did not participate in the school lunch; three were not permitted to eat at school because their mothers felt they did not eat enough of the food items served; four lived very close to school and chose to go home for lunch; one did a task at this time for a friend; three felt they were not able to pay for the lunch.

In order to get an overall picture of this community's dietary pattern one child from each of the 60 families represented was chosen for study. Since one of the purposes of the study was to try to improve the diets through the school lunch only those children who participated in this program were considered. These

children were chosen from grades one to 12 inclusive. In September, 1952, when 59 subjects were chosen, their grade distribution was as follows:

<u>Grades</u>	<u>Boys</u>	<u>Girls</u>	<u>Total</u>
1 and 2	6	5	11
3 and 4	3	7	10
5 and 6	6	4	10
7 and 8	5	5	10
9 and 10	4	6	10
11 and 12	3	5	8
Total	27	32	59

However, because of absence from school on the days on which the fall or spring dietary records (Form II, Appendix) were taken, or discontinuation of participation in the school lunch, or moving from the school district, some of the students automatically eliminated themselves since only those whose records could be obtained both in the fall and in the spring were considered valid. The number and grade distribution of the 45 subjects to be considered in this study follow:

<u>Grades</u>	<u>Boys</u>	<u>Girls</u>	<u>Total</u>
1 and 2	6	3	9
3 and 4	3	7	10
5 and 6	3	3	6
7 and 8	4	5	9
9 and 10	3	4	7
11 and 12	2	2	4
Total	21	24	45

Preliminary Sessions

Before any information was obtained from the subjects the classroom teachers were informed of the nature and purpose of the project, their part in it, the names of their students to be used as subjects, and approximate dates on which information would be collected.

During the study various forms were used (Appendix) which gave the following information:

Form I: Individual's record for general information and overall view of dietary habits. This consisted of 25 questions which would give a general picture of the community's dietary pattern and health habits which might affect their eating habits. The subjects answered these questions themselves. This survey was taken in the fall.

Form II: Record of food intake. On this each subject recorded the name of the food and the amount eaten for breakfast, between breakfast and lunch, lunch, between lunch and supper, supper, and before going to bed. This record was taken in the fall and again in the spring.

Form III: Estimation of probable adequacy of diet. On this were listed the seven basic food groups with the minimum frequency of daily use. The information received on form II was tabulated on form III by the writer to show the average daily servings from each food group.

Form IV: Food preference survey. This listed in columnar form 74 foods or food dishes. To the left of the food list were two columns in which the subject checked whether or not he had eaten the food; to the right were three columns in which the subject checked his reaction to the food as: liked, disliked, or no particular feeling. This survey was taken in the fall.

Form V: Record of milk consumed with the school lunch. This form was given to each classroom teacher at the beginning of the month. On it were listed the names of her students who participated in the school lunch. Either the teacher or one of the pupils checked daily the names of those children who had a half-pint of milk with their lunch. At the same time they also recorded on this form the absence from school of those who were school lunch participants.

Those who helped collect the information were four junior girls who presently were enrolled in Home Economics classes, five senior girls who had been enrolled in Home Economics, and the writer. Each time information was needed these girls were taken as a group, given a copy of the form which each subject later was to receive, were instructed in the mechanics of the form and also the purpose for collecting this information. Before any information was obtained the writer met with each group of subjects to explain the nature of the study, the reasons for the study, why they were chosen, the need for accuracy and honesty in all their survey reports, the confidence with which any and all information would be kept, and the fun of working together.

Data Obtained

To obtain some knowledge of family eating habits that influenced the dietary habits of the child each subject, with the aid of those collecting the information, filled out Form I. This information, obtained during the week of September 8, 1952, was used as a basis for a nutrition education program which was developed and carried out during the school year of 1952-1953.

A food preference survey (Form IV, Appendix) was taken during the week of September 22, 1952. From this survey school lunch menus were planned which included foods the subjects had eaten and liked as well as essential foods which they had not eaten or had eaten and disliked in order to try to increase their acceptance of these foods.

Before taking a three-day dietary record in the fall the subjects were instructed as to the necessity of accuracy in recording the exact amounts of foods eaten. To help them give an accurate record without being too conscious of measuring food they were asked to observe the number of spoonful of such things as vegetables or salads, the number of cups of beverages, squares of butter, slices of bread, size of meat servings, and number and size of such foods as carrot or celery sticks. The children in grades one and two were asked to have their mothers write their dietary records for all meals except the school lunch as it was felt that these children could not recall with any degree of accuracy what they had eaten. These same children were questioned by those who collected the information to obtain the record of their noon meal. With the exception of the children in grades one and two each child filled out his own dietary record obtaining help if necessary from those who collected the information. When the fall dietary record was taken it was then recorded by the writer to estimate its probable adequacy (Form III, Appendix). Having tabulated the three-day dietary record on this form an average for each food group was obtained. In the column titled "Remarks", a plus sign signified the daily requirements for that food group had been met or surpassed in the three-day average; a minus sign indicated a deficiency for the three-day average. The same method was used in the spring survey and observations made as to whether or not eating habits had changed.

All subjects were weighed in the fall and spring. Each elementary teacher weighed and measured her pupils at these times

as a part of a report to the county superintendent. The weights and measures of the subjects in this study (Table 9, Appendix) were taken from these reports. Subjects in grades nine through 12 were weighed and measured by the writer. This information was plotted on the Wetzel Grid in order to determine whether the subjects were showing a normal growth pattern, and if there was a relation between their eating habits and growth pattern. To interpret the data from the Grid the subjects were divided into four age groups: 5-8, 9-11, 12-14, and 15-17. These age groups were further divided into boys and girls.

To obtain an accurate record of milk consumption each classroom teacher was given monthly a copy of Form V (Appendix) on which was listed the names of all the students in her room taking part in the school lunch. Either she or a pupil in the room checked daily those who had a half-pint of whole pasteurized milk with their lunch. On this form were also recorded the absences of those participating in the school lunch so that at the end of the month the percentage of milk consumed with the school lunch could be determined by the following:

$$\frac{\text{Number of meals served with milk}}{\text{Number of meals served}} \times 100 = \text{per cent milk consumed}$$

A bar graph showing these percentages by months was made for each room and shown to the students. Later, all the graphs were displayed on the school bulletin boards.

A nutrition education program consisting of two phases, parent and student education, was initiated and conducted throughout the school year. At the October, 1952, meeting of

the Parent-Teacher Association, the mothers were assembled for the purpose of arousing their interest in such a program. They were told of the purposes of this program, how Damar was trying to realize these purposes, the efforts of those responsible to give their children the best food at minimum cost, the expectations of the parents; that is, to encourage the children to eat what was served so they would be well fed. Each mother present was given a copy of the Basic Seven food guide which was explained and she was asked to keep it in her kitchen and check it daily to see that her family was being properly fed. Mothers not present were sent a copy of the Basic Seven. To enable them to make this check on the eating habits of their family they were told that the children would bring them a copy of the school lunch menus one week in advance. Frequently a school lunch recipe which was a favorite among the students or one submitted by a mother would be included. At various times during the year short nutritional "pep talks" went home with the menus.

As a conclusion of the work for the year, but certainly not as a conclusion of the program, the mothers were assembled at the Parent-Teacher Association meeting in April to be thanked for their cooperation and given a pamphlet, "Food for the Family", published by the Metropolitan Life Insurance Company. They were told of the purposes and results to be expected from the white rat experiment which was a phase of student nutrition education. To further encourage more extensive use of fruits and vegetables in the diets, each mother present at a special meeting on April 27, 1953, was asked to submit her favorite fruit or vegetable

recipe which recipes would then be compiled into booklet form and given to each contributor.

Having aroused the interest of the parents there was a need for student education. The questionnaire, food preference survey and dietary record (Appendix, Forms I, II, and III, respectively) gave a good picture of the eating habits, dietary needs, and food likes and dislikes of the students. These forms were used as a basis for their nutrition education program.

A menu planning contest among the seventh and eighth grade children concluded a study in nutrition and meal planning. The entire day's menus were planned, with the noon meal being such as could be served on the school lunch. In addition, their names were published with their menus which appeared on the weekly menu sheets.

A series of posters illustrating "Home Pasteurization of Milk" was made by a Home Economics student and exhibited on school bulletin boards to show the students how they could have pasteurized milk at home as well as at school. These posters were self-explanatory. Other posters made by students showed that milk was not fattening, the percentage composition of milk and the contribution of vegetables to the diet.

While eating lunch with the students, the teachers would often ask for suggestions for vegetable dishes or vegetable salads which they would like to have served on the school lunch. Actual foods were used to illustrate a good and poor breakfast. All high school students, as well as the parents present at the Parent-

Teacher Association meeting that evening, observed and discussed the exhibit which was set up in the Home Economics room.

Probably the most interesting, and it was hoped the most valuable, part of the student's program was a rat feeding experiment, using four albino rats--two on a good diet and two on a poor diet. Before the arrival of the rats the students were told that the nature of the experiment was to show what could happen to their bodies if they did not eat properly or if some of them did not change their eating habits. Students in the seventh and eighth grade room made the cages from orange crates using the top of the crate for the front of the cage and covered it with window screening. Thus the side of the crate became the top of the cage. One of the slats on the top of the cage was removed and hinged to provide means for cleaning the cage, removing the rat, and putting in food and water. Each rat was given a name. Sam and Skippy were on the good diet; Pete and Pat were on the poor diet. The daily diets for the individual rats are given below:

<u>Good ration (Basic Seven)</u>	<u>Grams</u>	<u>Poor ration</u>	<u>Grams</u>
Green and yellow vegetables.	3		
Citrus fruits, etc.....	3		
White potato, cooked.....	10	White potato, cooked..	20
Milk, whole fluid.....	28		
Meat, cooked.....	3	Meat, cooked.....	3
Bread, enriched.....	3	Bread, enriched.....	9
Oleomargarine.....	1	Lard.....	1

At the end of 26 days the above rations were modified; the meat in the good ration was increased to six grams and the meat in the poor ration was eliminated. This was done to bring about visible external results more rapidly. The students, using a platform balance, weighed the food by the counter-balance method. The food

was weighed on Tuesday and Thursday by the students and on Saturday by the writer. On Saturday the rations were made up for Saturday, Sunday, and Monday; on Tuesday, for Tuesday and Wednesday; on Thursday, for Thursday and Friday. The milk was measured every day. The rats were weighed on Monday, Wednesday, and Friday. Only one rat at a time was removed from a cage. One student weighed the rat by placing it in a gallon can, the weight of which had been previously determined, and using metric weights on a platform balance. Another student recorded the weights in a book provided and determined the weight of the rat. A third student, using different colored pencils for each rat, then marked these weights on the growth curve chart which was fastened to the blackboard. Students also took their turns cleaning the cages and giving the rats their food. While weighing the rats, the students observed their behavior, external changes, and their gain or loss of weight. At the termination of the experiment one rat from each ration was killed and dissected in order to study bone structure. Several children expressed their desire to have one of the remaining rats so a drawing of names was held to determine which children would get a rat. The student who drew the rat which had been on the poor ration took a copy of a good ration which she intended to give it.

DISCUSSION OF RESULTS

Dietary and Health Habits

The dietary and health habits of the 45 subjects studied

are tabulated on Table 1. About two-thirds of this group always ate breakfast and one-third sometimes ate breakfast; however, further investigation showed that two out of 15 town children and 13 out of 30 rural children sometimes came to school without breakfast. Although only one subject admitted he never ate breakfast it was felt by the writer that many of those who reported they sometimes ate this meal, more frequently came to school without breakfast. Ten of the 13 rural children who sometimes ate breakfast got hungry at 10:00 A. M.; one of the two town children who sometimes ate breakfast did not get hungry at this time. Less than one-tenth of the 45 subjects always felt hungry about 10:00 A. M.

It was thought that perhaps insufficient time for eating was an influencing factor for many of the subjects who reported they sometimes ate breakfast. The time for arising varied from 5:30 A. M. to 7:30 A. M. The time of leaving for school showed a range of one hour and 15 minutes. This range was due to the study being conducted on both rural children who did farm work before coming to school and on town children who may have attended church services in the morning or who arose just in time for school. This would seem to indicate that perhaps the reason for some of the children's omitting breakfast was due to insufficient time to eat it.

An investigation was made to determine the relation between the number of children who always prepared their own breakfast and the number who sometimes ate breakfast. In slightly more than one-half of the cases studied breakfast was always prepared

Table 1. Dietary and health habits of 45 subjects.

	Number of subjects reporting		
	Always	Sometimes	Never
Breakfast			
Breakfast eaten	30	14	1
Foods eaten:			
a. Fruits	4	35	6
b. Cereal, whole grain or enriched	8	32	5
c. Protein food	13	29	3
d. Milk or cocoa	22	16	7
e. Coffee	3	10	32
Prepared by:			
a. Mother	27	16	2
b. Older sister	0	11	34
c. Self	1	15	29
Snacks			
Hunger felt about 10:00 A.M.	4	28	13
Eaten after school	30	14	1
Eaten before going to bed	10	19	16
Supper			
Foods eaten:			
a. Milk	7	22	16
b. Fruit	3	42	0
c. Vegetable other than potatoes	23	22	0
Go to bed at same time every night	12	28	5
	Number of subjects reporting		
	Always or sometimes		
Fruits for breakfast			
a. Citrus		19	
b. Canned		22	
c. Other fresh fruit		15	
Fruits for supper			
a. Fresh		19	
b. Canned		40	
Answers of subjects			
Amount of milk or cocoa for breakfast	1 to 2 cups or glasses		
Amount of milk for supper	1 to 2 glasses		
Types of food taken for			
a. After school snack	bread, jelly, cake		
b. Snack before going to bed	bread, jelly, cereal		
Time of arising	5:30 A. M. to 7:30 A. M.		
Time of leaving for school	7:00 A. M. to 8:15 A. M.		
Time of retiring	8:00 P. M. to 12:00 P. M.		

by the mother; in only one case did the subject always prepare his own breakfast. Two subjects reported their mother never got their breakfast. In one of these cases the mother was bedfast most of the time and the father got the children's breakfast; in the second, which concerned a senior girl who was the only child at home, the subject was at church during the family breakfast time and both parents had gone to work by the time she returned home.

By casual observation it was noted that, in general, the people in this community had a diet which consisted of meat, bread and potatoes with too few of them using adequate amounts of milk, citrus fruit or other fresh fruit, and vegetables other than potato. Seven subjects reported they never drank milk or cocoa for breakfast and 16 reported they never drank milk for supper. An investigation indicated the same seven subjects were on both the breakfast and supper lists. Of the seven who never drank milk for breakfast or supper only one never took it with the school lunch, four sometimes took it, and two always took it. The one subject who never took it with the school lunch reported he disliked milk and cocoa but liked chocolate milk. One-half of the subjects indicated they always drank milk or cocoa for breakfast but only seven reported they always drank milk for supper. Three of these seven always had milk for breakfast and lunch. Of those who always or sometimes drank milk or cocoa for breakfast or milk for supper the amount consumed was from one to two cups or glasses. Further investigation of fall diet records was made to determine which was the more popular beverage

for breakfast--milk or cocoa. The results showed there were 31 servings of cocoa and 28 servings of milk.

Approximately three-fourths of the subjects reported they sometimes had fruit for breakfast but less than one-tenth always had it. Forty-two subjects sometimes had fruit for supper but only three always had it. The kind of fruit served and the number of the 45 subjects who reported on the various kinds are shown below:

<u>Kind of fruit</u>	<u>Number of subjects who reported</u>	
	<u>Breakfast</u>	<u>: Supper</u>
Citrus only	8	0
Canned only	13	27
Other fresh fruit only	7	5
Citrus or canned	7	0
Canned or fresh	3	10
Citrus, canned or fresh	1	0

Due to the size and location of the town in which the study was made fresh fruit was not always available. This may have been an influencing factor in its consumption.

The report indicated that in 23 of the 45 cases studied the evening meal always included a vegetable other than potato.

Two-thirds of the subjects always ate a snack after school. This usually consisted of bread, jelly, or sweets such as cake, cookies or pie. Only rarely was fresh fruit or milk reported as eaten at this time. The large number of subjects participating in the after-school snack was not alarming but indicated that the children needed a new supply of energy at this time after having partially depleted the energy they may have received from a good school lunch.

Approximately one-fifth of the subjects ate before going to bed. This snack frequently consisted of bread, jelly or pre-

pared cereal. Occasionally ice cream was reported as eaten at this time. An investigation was made to determine if there was any relation between the time of retiring and the number taking bedtime snacks. Eight of the 45 subjects always ate before going to bed and their time of retiring varied from 8:00 P. M. to 12:00 P. M. This indicated the time of retiring did not necessarily influence the subject's taking a snack before retiring.

In the 45 cases studied there was a four-hour difference indicated in the time of retiring. This was to be expected because the subjects ranged in age from five to 17 years. Approximately one-fourth of the subjects always retired at a regular hour. Of this number 10 were in grades one through four. Five subjects never retired at the same time every night. These five were from grades three, four, seven and eleven. From these results it cannot be concluded that age was an influencing factor in having a regular time for retiring.

Food Preference Survey

Foods liked in Order of Preference. The results of the food preference survey (Table 2) indicated that of the 74 foods listed 56 were liked by two-thirds of the subjects and five were liked by all the subjects. These included peaches, pears, oranges, cherries, and white bread. Kennedy (1952) reported similar results from her study on food preferences of pre-army California boys, aged 17 to 19 years; seven of the 14 foods which received the highest ratings were fruit.

Table 2. Seventy-four foods as preferred by 45 subjects.

Food	:	Liked by	Food	:	Liked by
Peaches.....	:	45	Lettuce salad.....	:	36
Pears.....	:	45	Potatoes boiled in jackets..	:	36
Oranges.....	:	45	American cheese (yellow)....	:	35
Cherries, red.....	:	45	Prunes.....	:	35
White bread.....	:	45	Raisins.....	:	35
Hamburgers.....	:	44	Milk.....	:	34
Celery sticks.....	:	44	Baked beans.....	:	34
Apricots.....	:	44	Cabbage salad.....	:	34
Fresh apples.....	:	44	Liver.....	:	34
Orange juice.....	:	44	Meat turnovers.....	:	33
Grapefruit juice.....	:	44	Green beans.....	:	33
Weiners.....	:	43	Boiled beans.....	:	33
Mashed potatoes.....	:	43	Dried apricots.....	:	33
Blue plums (fresh).....	:	43	Rice pudding.....	:	32
Tomato juice.....	:	43	Canned tomatoes (hot).....	:	31
Cocoa.....	:	42	Cranberries.....	:	31
Raw tomatoes.....	:	42	Cranberry sauce.....	:	31
Boiled potatoes.....	:	42	Tapioca.....	:	31
Chocolate pudding.....	:	42	Sweet potatoes.....	:	30
Chili.....	:	41	Yellow wax beans.....	:	29
Raw carrots.....	:	41	Whole wheat bread.....	:	29
Corn.....	:	41	Pumpkin.....	:	28
Canned tomatoes (cold).....	:	41	Cottage cheese.....	:	27
Blue plums (canned).....	:	41	Creamed peas.....	:	27
Applesauce.....	:	40	Graham muffins.....	:	27
Toasted cheese sandwiches...	:	39	Lettuce carrot salad.....	:	26
Potato salad.....	:	39	Escalloped potatoes.....	:	26
Peanut butter sandwiches...	:	39	Cabbage-carrot-celery salad..	:	25
Meat loaf.....	:	38	Corn bread.....	:	25
Beans with ham.....	:	38	Buttered carrots.....	:	24
Baked potatoes.....	:	38	Spinach.....	:	23
Baking powder biscuits.....	:	38	Boston brown bread.....	:	23
Spaghetti and hamburger.....	:	37	Macaroni and cheese.....	:	20
Butterscotch pudding.....	:	37	Creamed carrots.....	:	19
Chocolate milk (cold).....	:	36	Lima beans, buttered.....	:	16
Ham loaf.....	:	36	Creamed celery.....	:	15
Buttered peas.....	:	36	Kidney bean salad.....	:	12

Only seven foods were liked by less than one-half of the subjects. These foods were spinach, Boston brown bread, macaroni and cheese, creamed carrots, buttered lima beans, creamed celery, and kidney bean salad. It was interesting to note that five of these seven foods were vegetables and two were creamed. Similarly, in the same study made by Kennedy (1952), 11 of the 14 foods receiving the lowest ratings were vegetables.

No food was liked by less than one-fourth of the subjects. It was interesting to note that kidney bean salad was liked by the least number of subjects.

Foods Disliked. The 64 foods disliked by one or more of the 45 subjects are listed in Table 3. No vegetable was disliked by more than 20 subjects. The food dish disliked most was again kidney bean salad. Its unpopularity may have been due to previous experience with poorly prepared salad. Poor preparation was one of nine factors listed by Baker and Ehlers (1949) as affecting the acceptance of school lunch dishes. Kavanaugh (1952) also stated that the food "must be acceptable to the patron's taste".

Of the foods disliked one-half were disliked by five or less of the subjects. Twenty-nine of the 30 vegetables or vegetable salads listed on the survey were checked as disliked; most of these were disliked by six or more subjects. Raw tomatoes was the only vegetable liked by all the 45 subjects.

Milk was disliked by only four subjects; chocolate milk likewise was disliked by four; cocoa was disliked by two. Of the four subjects who disliked milk, three liked chocolate milk or cocoa, and one disliked cocoa but liked chocolate milk. One of

Table 3. The 64 foods disliked by one or more of 45 subjects.

Food	Disliked by	Food	Disliked by
Kidney bean salad.....	20	American cheese (yellow)....	5
Macaroni and cheese.....	16	Cabbage-carrot-celery salad.	5
Creamed carrots.....	15	Prunes.....	5
Spinach.....	13	Rice pudding.....	4
Lima beans, buttered.....	11	Milk.....	4
Sweet potatoes.....	11	Chocolate milk (cold).....	4
Green beans.....	10	Toasted cheese sandwiches...	4
Pumpkin.....	10	Spaghetti and hamburger....	4
Cottage cheese.....	9	Canned tomatoes (hot).....	4
Whole wheat bread.....	9	Creamed celery.....	4
Graham muffins.....	9	Potato salad.....	4
Creamed peas.....	8	Applesauce.....	4
Lettuce carrot salad.....	8	Dried apricots.....	4
Corn bread.....	8	Corn.....	3
Meat turnovers.....	7	Chocolate pudding.....	3
Ham loaf.....	7	Cocoa.....	2
Buttered carrots.....	7	Beans with ham.....	2
Cabbage salad.....	7	Canned tomatoes (cold).....	2
Raisins.....	7	Baked potatoes.....	2
Tapioca.....	7	Boiled potatoes.....	2
Meat loaf.....	6	Peanut butter sandwiches....	2
Yellow wax beans.....	6	Baking powder biscuits.....	2
Baked beans.....	6	Weiners.....	1
Boiled beans.....	6	Hamburgers.....	1
Peas, buttered.....	6	Chili.....	1
Lettuce salad.....	6	Raw carrots.....	1
Potatoes boiled in jackets..	6	Celery sticks.....	1
Escalloped potatoes.....	6	Mashed potatoes.....	1
Cranberries.....	6	Fresh apples.....	1
Cranberry sauce.....	6	Blue plums (canned).....	1
Liver.....	6	Blue plums (fresh).....	1
Butterscotch pudding.....	6	Tomato juice.....	1

the two subjects who disliked chocolate milk and cocoa liked milk; three of the four subjects who disliked chocolate milk liked milk and cocoa.

Only 10 foods were not disliked. These were peaches, pears, oranges, cherries, apricots, orange juice, grapefruit juice, raw tomatoes, white bread, and Boston brown bread. These findings

compared with those of Kennedy (1951) who found fruits rating high in order of preference and vegetables among the foods receiving the lowest ratings. Bassnett and Patton (1951) also listed green and yellow vegetables, cooked tomatoes, and strong flavored vegetables as most frequently disliked.

Foods not Eaten. Table 4 lists the 51 foods not eaten by one or more of the 45 subjects. Approximately one-half of the subjects had not eaten 51 of the foods listed on the food preference survey; however, one-half of the foods checked as "not eaten" were checked by three subjects or less.

Only five foods were checked as not eaten by 10 or more subjects. These were creamed celery, buttered lima beans, cabbage-carrot-celery salad, kidney bean salad, and cottage cheese.

Twenty-four of the 30 vegetables or vegetable salads listed appeared among the foods which had never been eaten. The only vegetables or vegetable salads which had been eaten by all of the 45 subjects were celery sticks, mashed potatoes, boiled potatoes, corn, potato salad, and buttered carrots. More than one-half of the foods checked as not eaten were vegetables or vegetable salads.

Only four subjects had not tasted chocolate milk; only one had not tasted cocoa.

To the writer, the number of foods checked as not eaten seemed high. Although "not eaten" was meant to be interpreted as "never tasted", the writer felt that many of the subjects interpreted it as meaning "have tasted but not willing to eat". It was also felt that many of the students were not familiar with the food as it was named on the survey. In this community

Table 4. The 51 foods not eaten by one or more of 45 subjects.

Food	:	Not eaten by	:	Food	:	Not eaten by
Creamed celery.....	:	24	:	Raw carrots.....	:	3
Lima beans, buttered.....	:	14	:	Cabbage salad.....	:	3
Cabbage-carrot-celery salad.....	:	11	:	Sweet potatoes.....	:	3
Kidney bean salad.....	:	10	:	Blue plums (canned).....	:	3
Cottage cheese.....	:	10	:	Spaghetti and hamburger.....	:	2
Escalloped potatoes.....	:	9	:	Ham loaf.....	:	2
Creamed carrots.....	:	8	:	Faked beans.....	:	2
Spinach.....	:	8	:	Raw tomatoes.....	:	2
Corn bread.....	:	8	:	Lettuce salad.....	:	2
Lettuce carrot salad.....	:	7	:	Potatoes, boiled in jackets.....	:	2
Boston brown bread.....	:	7	:	Prunes.....	:	2
Macaroni and cheese.....	:	6	:	Cranberries.....	:	2
Creamed peas.....	:	6	:	Baking powder biscuits.....	:	2
Rice pudding.....	:	6	:	Cocoa (hot).....	:	1
Yellow wax beans.....	:	5	:	American cheese (yellow).....	:	1
Canned tomatoes (hot).....	:	5	:	Green beans.....	:	1
Pumpkin.....	:	5	:	Boiled beans.....	:	1
Taploca.....	:	5	:	Peas, buttered.....	:	1
Chocolate milk (cold).....	:	4	:	Canned tomatoes (cold).....	:	1
Meat turnovers.....	:	4	:	Apricots.....	:	1
Baked potatoes.....	:	4	:	Grapefruit juice.....	:	1
Dried apricots.....	:	4	:	Tomato juice.....	:	1
Cranberry sauce.....	:	4	:	Whole wheat bread.....	:	1
Graham muffins.....	:	4	:	Peanut butter sandwiches.....	:	1
Liver.....	:	4	:	Butterscotch pudding.....	:	1
Beans with ham.....	:	3	:		:	

many creamed vegetables are referred to as gravies; for example, creamed carrots are called carrot gravy. Many of the foods which appeared on this list as not eaten were eaten by nearly all the children when served on the school lunch.

Dietary Study

Fall and Spring Dietary Results. In the fall 34 to 41 subjects and in the spring 35 to 41 subjects ate daily less than one

serving of leafy green or yellow vegetables, less than three cups of milk, and less than three servings of butter or fortified margarine (Table 5). Thirty-nine subjects in the fall also ate less than one serving per day of citrus fruit, tomatoes, or cabbage. In the spring survey four times as many subjects, or about two-fifths of the total subjects, ate daily the recommended amount of vitamin C-rich foods. This noticeable improvement may have been due in part to one school lunch served during the spring survey (Table 7). This day's lunch included both raw cabbage and oranges due to a change which had to be made in the menu because apples were not available for that particular day.

All the subjects had one to two servings of meat or other protein-rich foods daily with the exception of one subject in both the fall and spring survey and another in the spring survey only.

Two or more servings of potatoes, other fruits and other vegetables were included in the daily diets of four-fifths of the subjects in the fall survey and of two-thirds of the subjects in the spring survey. Twice as many subjects in the spring as in the fall ate daily less than two servings of potatoes, other fruits and other vegetables. The following is a summary of the findings for this food group:

<u>Food</u>	<u>Total servings for three days</u>	
	<u>Fall</u>	<u>Spring</u>
Potatoes	182	155
Other vegetables	10	62
Other fruit	187	74
Total	379	291

Table 5. Fall and spring dietary study on 45 subjects.

Food groups			Number of subjects who ate			
			Recommended		Less than	
			amount		recommended	
			or more		amount	
			Fall	Spring	Fall	Spring
1. Leafy green or yellow vegetable	1 or more		4	4	41	41
2. Citrus fruit, tomatoes, cabbage	1 or more		6	25	39	20
3. Potatoes, other fruit, other vegetables	2 or more		36	27	9	18
4. Milk, cheese, or ice cream	1½ pints		11	8	34	37
5. Meat, fish, poultry, eggs, dried beans, dried peas	1 to 2		44	43	1	2
6. Enriched or whole grain bread or cereal	3		36	40	9	5
7. Butter or fortified margarine	3		11	10	34	35

From fall to spring there was a slight decrease in total potato consumption and a sharp decrease in total fruit consumption; however, the total consumption of other vegetables increased more than six times from fall to spring. This cannot be attributed to the school lunch menus as it will be noted in Table 7 that potatoes were served twice during the week of the fall survey and four times during the spring survey week. The results seemed to indicate that either the subjects were being served

less potatoes and fruit for the evening meal or else they were eating more bread instead of potatoes as it was observed that the average daily bread consumption was one and two-thirds times greater in the spring than in the fall.

There was no great change noted in the number of subjects who ate at least three servings of bread or cereal and butter or fortified margarine daily. This amount of bread or cereal was eaten daily by eight out of 10 subjects as shown on the fall survey and by nine out of 10 as shown on the spring survey. However, approximately two-thirds of the subjects in both seasons recorded eating less than three servings of butter and fortified margarine. It is possible that this was not a true picture of butter and fortified margarine consumption because the children usually ate buttered bread. Many of the subjects must have forgotten to record butter on their diet record sheets.

Comparison of Fall and Spring Dietary Habits. The greatest improvement was shown in food group two; approximately three-fourths of the 45 subjects showed an increase in their daily food intake of citrus fruit, tomatoes or cabbage (Table 6). This increase occurred at breakfast and at supper, as well as at lunch.

The least improvement was noted in group one (leafy green or yellow vegetables) in which about one-third of the subjects had increased their daily food intake, one-third remained the same, and one-third decreased their daily food intake. By comparing this with the results in Table 5 it was noted there was no change in the number of subjects in the fall and spring surveys who reported they ate daily one or more servings of leafy green

Table 6. Comparison of fall and spring dietary habits of 45 subjects.

Food groups	:Number of subjects whose daily food intake		
	: Increased	:Remained same:	Decreased
1. Leafy green or yellow vegetables	15	14	16
2. Citrus fruit, tomatoes, cabbage	34	8	3
3. Potatoes, other fruit, other vegetables	11	2	32
4. Milk, cheese, or ice cream	15	6	24
5. Meat, fish, poultry, eggs, dried beans, dried peas	16	3	26
6. Enriched or whole grain bread or cereal	25	4	16
7. Butter or fortified margarine	17	3	25

or yellow vegetables. Of the four subjects who ate daily the recommended amount for this group in the spring survey only one also had the recommended amount in the fall survey.

Approximately seven out of 10 subjects decreased in their daily food intake for potatoes, other fruit and other vegetables; only slightly more than two out of 10 increased their daily food intake for this group.

Only one-third of the subjects showed any improvement in daily milk consumption; whereas, one-half of them showed a decrease.

This was not in accordance with results expected and can only be explained by stating that in order to retain the number of subjects who drank milk and recruit new subjects more concrete evidence of the value of milk was needed. In the previous school year a decrease of milk consumption with the school lunch from fall to spring was also noted.

The citrus fruit and bread or cereal are the only two food groups in which the number of subjects whose daily food intake increased was greater than the number whose daily food intake decreased. Oranges, cabbage, and tomatoes appeared on the school lunch menus in various ways during the year and it was hoped this gave the mothers new ideas for serving these foods at home.

Milk Consumed with School Lunch

How to increase the consumption of milk was an important nutritional problem in this study. The percentage of children who consumed milk with the school lunch is shown on Fig. 1. With the exception of grades seven and eight, which had 100 per cent milk consumption for the nine months of school, there tended to be a fluctuation from month to month and five of the six groups showed a decrease from September to October. In September the novelty of a new type of milk service may have appealed to some children, but by October the novelty factor was no longer present and consumption of milk with the school lunch may have dropped as a result.

Grades nine and 10 had the lowest yearly average for milk

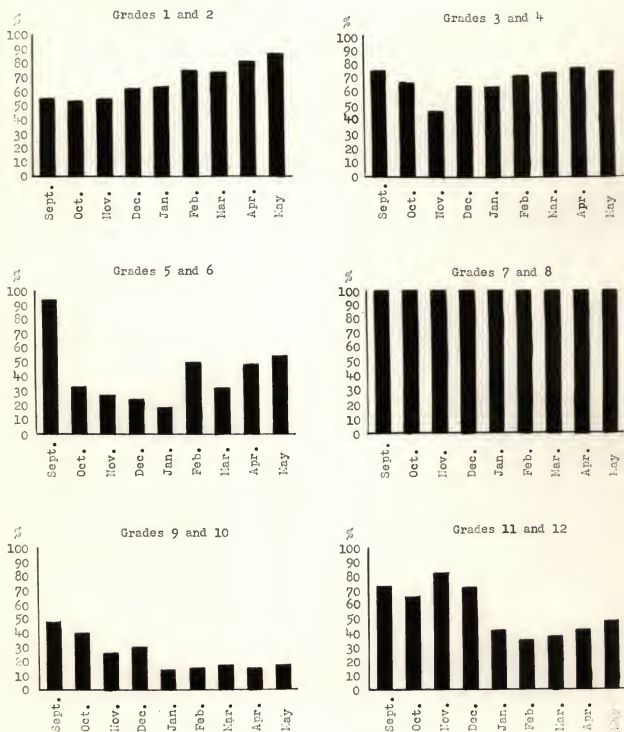


Fig. 1. Percentage of children in each grade-group who consumed milk with the school lunch.

consumption with the school lunch; 26 per cent, or approximately seven children per day, took a half pint of whole pasteurized milk. Only one subject from this group reported he disliked milk. Upon inquiry it was learned that many of the children would take milk if they were permitted to add chocolate sirup to it. This was not in accord with the school lunch regulations so was not permitted. However, several of these children stated they frequently drank chocolate milk at home.

Of the six groups recorded, grades five and six showed the sharpest decline in any one month dropping from 93 per cent in September to 31 per cent in October. This same group also showed the greatest improvement in any month increasing from 19 per cent in January to 50 per cent in February. The aim of this group from February to May was to have 100 per cent milk consumption with the school lunch in order that they might have the same record as grades seven and eight. They actually achieved 54 per cent milk consumption in May.

To determine the relation between drinking milk at school and at home an investigation was made of the children in grades seven and eight. Although all children in this group drank milk at school every day, of nine from this group who were subjects in this study, only five in the fall and six in the spring had it with both breakfast and supper.

School Lunch Menus

One of the aims of this study was to try to improve the

dietary habits of the elementary and secondary pupils in this particular school through the school lunch program. The menus given in Table 7 were used during the two weeks when the fall and spring dietary records were taken and are typical of the year's menus which were planned to meet the type A lunch requirements.

If every child ate standardized portions of the menus served he would be provided with one-third to one-half of his daily nutritive requirements. Through observations it was felt that this ideal was not being met in many cases. Too many children often took just what they wanted and only as much as they wanted. In the lower grades many of the children omitted meat and vegetables from their lunch. On the other extreme the upper grade children, who were the last to get their lunch, often had double servings.

Since oven facilities were limited, menus were planned to meet the type A requirements and still have only one oven dish. Time for preparation was another factor in menu planning. There were two cooks who commenced work at 8:00 A. M. and had to have everything ready to serve at 11:20 A. M. Three students came in at this time and assisted in serving the lunch. No other help was given.

It was felt that the non-acceptance or poor acceptance of some foods may have been due to the attitude of the student servers. They were always told the size of portions to serve but often were not curious enough about new foods to inquire and know what they were serving. Some children would not even taste a particular food because they did not know what it was. This was

Table 7. School lunch menus served during fall and spring dietary surveys.

Fall survey	:	Spring survey
Oct. 14, 15, 16, 1952	:	April 7, 8, 9, 1953
Menus served	:	Menus served
Monday, October 13		Monday, April 6
Beef stew		Hamburgers
Carrot strips		Mashed potatoes and gravy
Peanut butter sandwiches		Spinach
Fresh pears		Bread and butter sandwiches
Milk		Jello fruit salad
		Milk
Tuesday, October 14		Tuesday, April 7
Ham loaf		Weiners and sauerkraut
Mashed potatoes and gravy		Mashed potatoes
Cabbage salad		Bread and butter sandwiches
Bread and butter sandwiches		Peach cobbler
Blue plums (fresh)		Milk
Milk		
Wednesday, October 15		Wednesday, April 8
Chili and crackers		Ham salad sandwiches
Lettuce-celery salad		Creamed potatoes
Peanut butter sandwiches		Carrot-apple-celery salad
Apple crisp		Gingerbread with vanilla sauce
Milk		Milk
Thursday, October 16		Thursday, April 9
Meat loaf		Potatoburgers
Mashed potatoes		Cabbage pineapple salad
Carrot-apple-celery salad		Bread and butter sandwiches
Bread and butter sandwiches		Fresh oranges
Chocolate pudding		Milk
Milk		
Friday, October 17		Friday, April 10
Macaroni and cheese		Mackerel loaf
Carrot jello salad		Potato salad
Peanut butter sandwiches		Peas and carrots
Fresh apples		Bread and butter sandwiches
Milk		Fresh apples
		Milk

noted especially in the case of pumpkin. Its first appearance on the school lunch was as a pie filling but served in custard cups.

Many of the children did not recognize it and the student server had not asked what it was. As a result, many did not take it. During the course of their lunch the other children, who had taken it, informed them how good it was. Upon learning what the dessert was those children returned to the serving window and got theirs. Several asked to have a second serving of the dessert. At other times it was felt that the student servers could have done much to increase the acceptance of food by remarking on how good it was and suggesting they try just a little of it.

Previous surveys indicated that fresh vegetables were not used frequently in most of the homes. It was hoped that through the extensive use of fresh vegetables on the school lunch the children would become familiar with this type of food and encourage their mothers to use more fresh vegetables at home. By sending home weekly a copy of the school lunch menus it was hoped that the mothers could become more acquainted with better meal planning.

Nutrition Education

Parent Education. In a study of this type, in which efforts are made to improve dietary habits, no degree of success can be realized unless the parents know what they are to do and why. They need to be given concrete evidence of the need for better nutrition habits for themselves and their families. Nutritional material must be presented on their level so they can actually

work with the nutritionist in accomplishing this objective. Such were the two aims which the writer used in this phase of the nutrition education program. Basnett and Patton (1951) made a similar statement stressing the tremendous influence and responsibility of the home in a nutrition education program.

At the October meeting of the Parent-Teacher Association the mothers were first made aware of the necessity of improving the dietary habits of their children. These mothers were told that many of the children needed to improve their breakfast habits as well as other eating habits. At this time the mothers were enthusiastic about the program and agreed that something needed to be done about the breakfast habits of their children. However, after a few months observation, it was felt that the agreement was merely passive so a nutritional "pep talk" concerning breakfasts went home one week with the school lunch menus. The value of the "pep talks" was not measured by score cards, surveys, or questionnaires but by questioning groups of students about breakfast. Little actual improvement was noted. (Table 10, Appendix).

Sending home the school lunch menus was an interesting experience for both the sender and the receiver. On Friday afternoon just before dismissal of school a copy of the menus for the coming week was given to the oldest child of each family. These copies were given to non-participants in the school lunch as well as participants since it was felt that all could profit from them and also so that there would be no distinction made between these two groups. The mothers often stated their pleasure

in receiving these especially when a favorite school lunch recipe was sent with the menus. In fact the writer sometimes felt they were more interested in the recipe than the menus because in one case the mother did not receive her copy of the menus for one week and when she learned from a neighbor that an excellent recipe had been sent she immediately requested a copy. It was not always possible to send a recipe every week and occasionally two or three weeks would elapse before one was sent. Several high school students, both boys and girls, often came and asked when another recipe was to be sent because their mothers liked them. It was suggested at the October meeting of the Parent-Teacher Association that the mothers send their favorite recipe to the writer who in turn would send them on to the others by way of the school lunch menus. There was a poor response to this suggestion.

At the April meeting of the Parent-Teacher Association the mothers were again assembled to thank them for their cooperation during the year and to explain the nature of the white rat feeding experiment which was a part of the student nutrition education program. These mothers seemed interested in the experiment and questions which they asked led to a lively discussion which gave the writer an opportunity to introduce some nutrition points. At the opportune moment during the discussion a pamphlet, "Food for the Family", was presented and explained. At the close of the meeting one mother asked for two additional copies for friends of hers who had no one in school and therefore would not receive

a copy. The mothers present expressed their desire to receive copies of the school lunch menus during the next school year.

To stimulate new interest in the use of fruits and vegetables, recipes for their use were collected from interested mothers. These recipes were then compiled into booklet form and a copy given to each contributor.

Student Education. If any improvement was to be made in the children's dietary pattern, then the children must be given good reasons for wanting to improve their eating habits. Previous experience with elementary and secondary children proved their preference for doing things with their hands rather than with their heads. With this in mind a student nutrition education program was initiated in which the children learned while doing, without going through the painful process of formal study. This program was conducted mainly in grades seven through 12 with occasional participation by the other grades.

The foods class was considered an ideal nucleus for this program since it was a small group and had received the theory underlying many of the projects which were developed. After a study on milk one of the students in this class made a poster which illustrated the food value of milk; she drew in actual size a quart bottle of milk and used various colors of tempera paint to designate the different constituents. This, as well as all posters made by the students, was displayed on the bulletin board. Many high school girls who did not drink milk because they considered it fattening were very surprised when they saw the poster

and realized what a small amount of fat was in this food. Then they returned with the question, "Why do babies get fat on milk?" This was answered by telling them that a carbohydrate was added to the milk and that even though the baby's diet did contain much milk it was not the only food received.

Another poster showed two girls; one, with an ideal figure, drinking a glass of milk; the other, with a chubby figure, eating a candy bar. No caption for the poster was necessary.

A series of 10 posters illustrating home pasteurization of milk was made by a foods class member. The drawings on these produced comment, and they also afforded discussion and an opportunity to stress the need and value of such a process.

At the conclusion of their study on breakfast the foods class members exhibited in the hall a good and poor breakfast. Actual foods were used for this exhibit. The good breakfast consisted of a grapefruit half, oatmeal with milk and sugar, a fried egg, toast and butter, and milk. The poor breakfast was represented by a cup of coffee. All of the high school students saw the exhibit during the course of the afternoon. Since there was a Parent-Teacher Association meeting in the evening, it was also displayed in the Home Economics classroom for the parents to observe. The comments of both parents and students were carefully noted and it was evident from their remarks that many of them did not always have an ideal breakfast.

By conversing with the children during the noon period much was learned concerning their dietary habits. They usually re-

vealed more at this time than during a class period. One junior girl stated that she never ate breakfast and upon arising was not hungry. She was a Home Economics girl and knew the results of such a practice but evidently classroom teaching had not had its effect. An agreement was made with the writer whereby the girl would eat one thing of her choice every morning for a week; the second week, two things; and the third week, three things. She reported daily, but her report was not always in conformity with her agreement, although it was felt that she was trying. No further check was made after three weeks until early spring. Questioning at this time revealed she had again slipped back into her old habit.

Students in the seventh and eighth grades, after a less intensive study of nutrition and meal planning, taught by their classroom teacher prepared some valuable poster material. Each student made a set of posters illustrating foods rich in carbohydrates, fats, proteins, vitamins A and D, ascorbic acid, and the B-vitamins. At the top of the poster was the name of the food nutrient, the sources of which were illustrated; at the bottom, was given its function in the diet. These posters were judged by the Home Economics teacher and the three winners had theirs displayed in the Home Economics classroom for the high school students to observe.

Another project which was developed after studying this unit was a menu planning contest. Each of the 30 students, using the Basic Seven as a guide, planned a complete day's menus. The

noon meal was so planned that it might be used as a school lunch. The Home Economics teacher selected 12 winners from the 30 menus submitted. One or two of these winning menus were used weekly on the school lunch program. The winners were thrilled to see their names beside their menu as it appeared on the weekly menu sheet. One winner included the recipe for a new main dish which she had suggested for the school lunch. This dish, as well as the rest of her menu, was such a favorite with the children that it was used several times during the year.

High school students became interested when they saw the names of their younger brothers and sisters or friends appearing on the menu sheets. A few asked if they, too, might submit menus for the school lunch. They were given the lunch requirements and their menus, if satisfactory, were also used. Mothers of these winners remarked that they were going to have these children plan all their menus.

Probably the most interesting and valuable phase of the student nutrition education program was a white rat feeding experiment. Four male albino rats ranging in weight from 51 to 68 grams were used. Without reference to weight, two were selected to be fed the Basic Seven ration and two a poor ration. The seventh and eighth grade children were chosen to carry on the work of the experiment. Previous to the arrival of the rats these students were told of the nature and procedure of the experiment, equipment and care which would be necessary, and the results which were expected. Boys volunteered to make the cages,

which were unique. When the rats arrived there was much excitement. In less than five minutes one had received a name. The animals were kept in the high school science room in order that classroom work might not be disturbed and so other students might have more opportunity to see the results of the experiment. Weighing and feeding time was looked upon by the students as a time of real enjoyment. They were anxious to learn the amount of weight gained by each and soon realized that Pete and Pat, who were being fed the poor ration, did not gain as rapidly as Skippy and Sam, who were being fed the Basic Seven. Following the modification of the ration after 26 days, the students observed a slight loss of weight on the rats which were fed the poor ration. During the remainder of the experiment there tended to be a fluctuation and noticeable difference in weight gained as compared with the weight record of the rats which were fed the Basic Seven ration (Fig. 2).

All of the school children were permitted to see the rats at appointed times during school hours or at other convenient times. The most interesting group visit was made by 42 first and second grade children. After the results of the experiment were explained the rats were taken from the cages and each child was permitted to touch the animals if he cared to. No child refused to touch one. The rats were then placed side by side and held as still as possible in order that the children could observe the difference in body size. Sam was then taken as an example of a milk drinker and Pete of a non-milk drinker. After a short

talk to them in which the results of such a practice were shown to be evident in Pete, whose body was smaller, the question was asked of the children, "How many are going to take milk with their lunch this noon?" Every hand went up. After the visit the children prepared for lunch. Observations made on this day revealed the same children were still non-milk drinkers with their school lunch. Personal questioning of each of them indicated that it was merely prejudice and not an actual dislike of milk.

Many parents also became interested in the experiment, having been told of it by the children. On evenings when the Parent-Teacher Association met there were crowds of mothers, fathers, and pre-school children congregating in the science room in order to see the rats and learn of the experiment. Such parent interest was not anticipated but certainly was appreciated. This interest led to an amusing incident on the evening of a music recital. The science room was kept locked as a safeguard to the experiment. There were only two people who had a key to this room--the janitor and the writer. During the recital a light was noticed in the science room. Upon investigation it was learned that three fathers had heard of the rat experiment but had not seen the rats and had asked the janitor to open the room for them. The janitor was explaining, in his own terms, the nature and result of the experiment and from what was heard he knew exactly what was happening and why.

At the termination of the experiment two of the rats were killed and dissected and their bone lengths compared. The rat

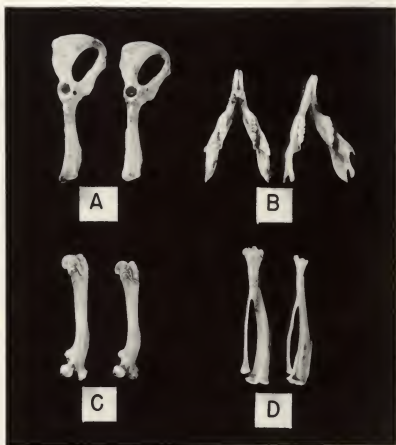


Fig. 3. Photograph of rat bones.

Pair A, hip; B, jaw; C, thigh; D, leg.

In each pair the bone at the left is from animal on Basic Seven ration, the bone at the right is from animal on poor ration.

which had been fed the Basic Seven ration had longer bones than the rat on the poor ration (Fig. 3).

It was felt that such an experiment was of far more value to the children than any amount of formal presentation of book material. In addition to its value as a nutrition experiment it also eliminated much of the fear of handling such animals.

Height-weight Records

Physical development of the subjects during the seven month period from October to May was determined by plotting height and weight measurements on the Wetzel Grid. For each child at each season body build was measured by physique channel, stage of growth by developmental level, and relative advancement or retardation in comparison with Wetzel norms by auxodrome of development measure in percentiles from highly advanced, second percentile, to greatly retarded, ninety-eighth percentile. For each child the rate and pattern of growth over the seven month period were also determined. Relative rate of growth was measured by the number of developmental levels which the child advanced in comparison to the standard of one level per month or seven for the period. Pattern of growth was judged by maintenance of, or shift in physique channel. Maintenance of physique channel or a shift of only one channel was considered normal; a shift of two or more channels in either direction was investigated for its possible significance.

A study of the subjects appearing in each physique channel (Table 8) showed that 24 of the 45 subjects in the fall and 28 in the spring had good physique with their height-weight relationship plotted in channels A₁, M, or B₁; two of the 45 subjects in the fall and three in the spring were obese, in channel A₄; only one subject had poor physique, in channel B₄; this occurred in spring. Investigation of the subjects who tended to be obese showed that one was a seven year old boy who moved to the B₁ channel in the spring. His eating habits were better in the fall than in the spring. The other subject who tended to be obese was a 16 year old girl who remained in this channel in the spring. A study of her eating habits indicated that in the fall she was eating recommended amounts daily for each of the Basic Seven food groups except leafy green or yellow vegetables and citrus fruit; in the spring she was low only in milk and butter. The one subject who had poor physique in the spring was a 12 year old boy who had fair physique in the fall; however, he had progressed nine developmental levels and had moved from the 98 percentile (retarded) to the 82 percentile (less retarded) between fall and spring. A study of his eating habits showed that in the fall and spring he ate daily the recommended amounts of vitamin C-rich foods and meat or other protein-rich foods. In the fall he ate daily three cups of milk; in the spring he ate daily at least three servings of bread or cereal.

An improvement from fall to spring was indicated in the number of subjects who were below the 67 percentile level, or below

Table 8. The distribution of 45 subjects in five channels of development.

Channels of development for 21 boys (1)										
	A ₄	A ₃ , A ₂	A ₁ , M, B ₁	B ₂ , B ₃	B ₄					
Age	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
5-6-7-8	1	2	2	1	6	5	0	0	0	0
9-10-11	0	0	0	1	1	2	2	1	0	0
12-13-14	0	0	1	0	4	3	2	1	0	1
15-16-17	0	0	1	0	2	5	0	0	0	0
Channels of development for 24 girls.										
5-6-7-8	0	0	1	1	4	3	4	1	0	0
9-10-11	0	0	1	1	1	3	2	2	0	0
12-13-14	0	0	0	1	3	3	2	2	0	0
15-16-17	1	1	1	1	3	4	0	0	0	0
Totals for boys and girls	2	3	7	6	24	28	12	7	0	1

1. Type of body build according to channels:

A ₄	obese	B ₂ , B ₃	borderline
A ₃ , A ₂	stocky	B ₄	poor
A ₁ , M, B ₁	good		

normal growth. In the fall seven of the 45 subjects were below normal; of these, five were in the 12-14 year age group. In the spring five of the 45 subjects were below normal; of these, three were in the 12-14 year age group; one had shifted to the 67 per-

centile level of growth and one had advanced to the next age group. Not more than one in the fall or spring was in any one of the other three age groups. A study of the dietary records of each of these subjects indicated that the subject who reached the 67 percentile level in the spring consumed daily at least three cups of milk as recorded on his spring dietary record; one 13 year old boy who regressed from the 82 percentile to the 98 percentile level had no improvement in his dietary pattern; a 12 year old girl also went from the 82 percentile to the 98 percentile and her dietary record showed that in the spring she was eating less potatoes and other fruits and vegetables but was eating at least one serving of leafy green or yellow vegetables and vitamin C-rich foods daily; a 12 year old boy went from the 98 percentile to 82 percentile level and his dietary record showed that he did not drink daily at least three cups of milk but had increased his daily intake of bread or cereal; the 14 year old boy who stayed in the 98 percentile level drank less than three cups of milk daily in both fall and the spring.

Five of the 45 subjects showed a shift from fall to spring of two or more channels. Three of these were seven year old boys. Two had shifted from the stocky to the obese; however, one had progressed 13 developmental levels and the other 14. A third had shifted from the obese to the good channel. A study of their eating habits indicated that in all three cases they ate daily the recommended amounts of more of the Basic Seven food groups in the fall than in the spring. The other two subjects were 11 and

12 year old boys; the eleven year old boy had improved his eating habits from fall to spring; the twelve year old boy remained the same. This seemed to indicate that the shift of channels was caused from something other than diet.

Of the 45 subjects, 16 progressed less than seven developmental levels from fall to spring. Their distribution by sex and age groups was as follows:

Age of subjects	<u>Total number</u>		<u>Number who advanced less than seven levels</u>	
	Boys : Girls		Boys : Girls	
5-6-7-8	9	9	0	1
9-10-11	3	4	0	1
12-13-14	6	6	2	4
15-16-17	3	5	3	5

One out of nine girls in the 5-8 year age group did not progress at least one developmental level per month; one out of three girls in the 9-11 year age group failed to make the normal progression; two out of six boys and four out of six girls in the 12-14 year age group progressed less than seven developmental levels; none of the subjects in the 15-17 year age group progressed at the rate of one developmental level per month.

The eating habits of these 16 subjects were poor. They had an average daily intake of 3.3 to 3.6 of the Basic Seven food groups. In general, they did not eat daily the recommended amounts of milk, butter or fortified margarine, and leafy green or yellow vegetables. Both in the fall and in the spring most of them ate daily the recommended amount or more of meat or other protein-rich foods, bread or cereal, and in the spring, vitamin C-rich foods. This eating pattern was essentially the same as that for the total

group of 45 subjects. This would seem to indicate that for this group of 45 subjects there was no relation between normal growth and eating habits as assessed by this study. However, it may be stated that although the eating habits were poor for all age groups the effects of such habits may show more results in the 12-14 year age group where rapid growth is occurring than in the younger or older age groups.

A consideration of the subjects with highly advanced development showed the same 15 year old boy in the fall and in the spring had achieved the second percentile level; two girls in the fall were also two of the five girls in the spring who were in this level. In studying the subjects with greatly retarded development (the 98 percentile level) it was noted that one of the two boys in the fall was also one of the two boys in the spring who were shown in this level. There were no girls in the fall but one girl in the spring in the 98 percentile level.

CONCLUSIONS

As a result of the study to try to improve the diets of elementary and secondary school children through nutrition education and the school lunch program the following conclusions may be stated:

1. Many of the school children had poor eating habits as indicated by their failure to eat breakfast and their low intakes of milk, leafy green and yellow vegetables and vitamin C-rich foods.

2. One-third of the 45 subjects studied failed to eat breakfast regularly. A very poor breakfast pattern was shown among the two-thirds who reported they always ate breakfast as well as among the one-third who sometimes ate breakfast.

3. The average daily intake of milk was less than three cups for over two-thirds of the subjects, indicating that the diets of these children probably were not supplying their daily calcium needs, and possibly not their daily riboflavin needs.

4. About nine-tenths of the subjects in both the fall and spring were eating less than one serving daily of leafy green or yellow vegetables.

5. Although the average daily intake of vitamin C-rich foods increased from 0.3 servings in the fall to 1.0 servings in the spring, only one-half the subjects in the spring were eating one serving or more daily.

6. The average daily intake of meat or other protein-rich foods was approximately three servings, about two to three times the recommended amount. Bread and other cereal products were eaten in large amounts by most of the subjects, as indicated by an average daily intake of 4.2 servings in the fall and 7.0 servings in the spring. Although butter was not recorded on the dietary records as often as bread, it was felt that this was an omission because most of the children ate their bread buttered.

7. Vegetables appeared most frequently as food disliked or not eaten. These foods appeared less frequently on dietary records than did meat, bread and potatoes.

8. Although adequate school lunches were planned and served, this did not insure that every child always took all the food provided, particularly the milk and vegetables.

9. Height-weight records plotted on the Wetzel Grid indicated that for this group of 45 subjects there seemed to be no relation between normal growth and eating habits as assessed by this study. Although the eating habits were poor for all age groups the effects of such habits may show more results in the 12-14 year age group where rapid growth is occurring than in the younger or older age groups.

10. Nutrition education and its resultant improvement in dietary habits is a long-term program, the results of which cannot be measured at the end of an eight month period. Although both parents and children showed definite interest in the nutrition education activities, this interest was not translated into improvement of the children's eating habits.

SUGGESTIONS FOR FURTHER STUDY

Further development of this study would include a program to improve milk consumption. In grades one to six this might be effected by distribution of educational material which could be used by the classroom teacher either as supplementary reading or as a part of her regular health education class. Art work, which illustrated the value of milk in the diet or the ill effects of insufficient amounts of milk, could also be used to stimulate in-

terest. On the junior and senior high school level the problem could be attacked by appealing to the interests of the child at that age; namely, the boy is interested in being the best athlete and the girl wants pretty hair and a nice complexion. Contests would also be effective with this age group.

In an effort to increase the consumption of leafy green or yellow vegetables, home gardens as 4-H projects could be an effective means of arousing the interest of these rural children in vegetable production for their families. During the winter months the mothers could be encouraged to use more fresh vegetables not only from a nutritive point of view but also from an economical one. Figures computed on school lunch costs indicated that some fresh vegetables were generally more economical than canned ones. It would be the duty of someone trained in nutrition to impart information to the mothers about attractive and nutritionally economic ways of preparing and serving fresh vegetables.

A greater intake of vitamin C-rich foods could be made possible for the school children by serving citrus fruit juice in the mid-morning. In this particular school there are occasions when most of the children have attended church services in the morning and have brought sweet rolls from home which are to serve as their breakfast. On these mornings it would be a beneficial practice to sell at cost to the children milk and oranges which would supplement the breakfast brought from home.

In order to increase the acceptance of vegetables the chil-

dren will need to be educated to eat them because they like them, and they may be able to influence their mothers to serve vegetables with their home meals. Mothers could be given appetizing and simple-to-prepare recipes which may encourage them to use these foods.

Since the average daily consumption of bread and other cereal products was well above the amount recommended on the Basic Seven food guide, mothers could be advised to feed their families more vegetables in order that bread consumption might be decreased to the recommended amount and vegetable consumption could be increased.

Further work in student nutrition education could consist of teaching all of the children and not only the junior and senior high school groups. This would be more effectively accomplished if the nutritionist, after obtaining the approval of the principal and carefully planning the program and its activities, would meet with the elementary teachers, sell them the idea of nutrition education, and give each of them a written copy of suggested health and nutrition studies and activities for their grade level. In order to keep the program developing the nutritionist could visit the elementary grades, commend the children for their fine work, and particularly could she encourage the teacher by commendation and by making suggestions for new projects. Animal feeding experiments, such as the one conducted in this study, might have more value if they were conducted by the children whose eating habits should improve after seeing the results of the experiment.

The parents' interest in better nutrition has been stimulated. In the future this interest could be continued by student presentation of better nutrition through skits at the Parent-Teacher Association meetings and exhibits or posters displayed on the evenings when this group meets.

SUMMARY

The purpose of this study was to try to improve the diets of elementary and secondary school children through nutrition education and the school lunch program. The Damar consolidated school in Rocks County, Kansas was chosen for study. There were 184 children enrolled and 173 of these participated in the type A plate lunch which was served. In order to get an overall picture of this community's dietary pattern one child from each of the 60 families represented was chosen for study. Forty-five school lunch pupils from grades one through 12, ranging in age from five to 17 years, actually participated because only these had records for fall and spring.

A dietary and health habit survey taken in the fall indicated that many of the children had poor eating habits, particularly in respect to breakfast, and to milk, fruit, and vegetable consumption.

A food preference survey given in the fall indicated that fruits rated high among foods liked and vegetables rated high among foods disliked or foods not eaten.

Three-day dietary records taken in both the fall and spring

indicated that the diets of many of the subjects were low in milk, leafy green or yellow vegetables, and vitamin C-rich foods. Although the average daily intake of vitamin C-rich foods increased from fall to spring, only one-half of the subjects in the spring were eating one serving or more daily. In the fall and spring three-fourths of the children consumed daily less than three cups of milk, less than one serving of leafy green or yellow vegetables, and less than three servings of butter or fortified margarine. The average daily intake of meat or other protein-rich foods was approximately three servings or about two to three times the recommended amount. Bread and other cereal products were eaten in large amounts by most of the subjects.

Daily records kept by each classroom teacher showed that the number of children taking milk with the school lunch decreased from fall to spring. Grades seven and eight had 100 per cent milk consumption with the school lunch throughout the nine months period, but milk consumption in the other five rooms fluctuated from month to month and ranged from 14 to 92 per cent.

Although type A lunches were planned and served, this did not insure that every child always took all the food provided, particularly the milk and vegetables.

For the 45 subjects there was no obvious relationship between eating habits and pattern of growth as determined by plotting height and weight measurements on the Wetzel Grid. In the fall five-sixths of the subjects had good growth and slightly more than one-half had good body build, but more subjects were

of thin build than were of stocky build. Although eating habits were poor for all age groups the effects of such habits on individual growth patterns were most apparent in the 12-14 year age group where rapid growth was occurring.

A nutrition education program was directed toward both students and parents. Student nutrition education was developed in grades seven through 12 and consisted of studies in nutrition, menu-planning contests, poster contests, a good and poor breakfast exhibit, and an animal feeding experiment. Parent education was effected mainly by assembling the mothers after Parent-Teacher Association meetings. At such times informal discussions were held, literature distributed and explained, and ideas exchanged. Each mother also received in advance a copy of the school lunch menus which frequently included a recipe and sometimes a nutritional "pep talk".

Certain foods which the children had previously disliked or not eaten were accepted when served on the school lunch. This indicated that the school lunch program did change eating habits. Although consumption of vitamin C-rich foods did increase during the year, other dietary habits were apparently unaffected by the nutrition education program. Both children and parents showed a definite interest in the nutrition education program but the results of such a program can not be measured adequately at the end of only an eight month period.

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APPENDIX

FORM I

Name _____ Age _____
 Home: Farm _____ Town _____ Grade _____
 Sex _____
 Name of parent or guardian: _____
 Nationality of father: _____. Nationality of mother: _____
 Occupation of father: _____
 Observations: Date: _____
 Weight _____
 Height _____
 Nutritional deficiencies noted: _____

Information Questions

Directions: For each question that has three blanks in front of it place a check in the blank that makes the question true for your case. If only one blank precedes a question then put down the specific answer for that question.

Always Sometimes Never

- | | |
|----------------|---|
| _____ | 1. Do you eat breakfast? |
| _____ | 2. Do you eat fruit for breakfast? |
| _____ | 3. What kind of fruit do you eat for breakfast? |
| _____ | 4. Do you eat a whole grain or enriched cereal for breakfast? |
| _____ | 5. Do you have a protein food, as meat or eggs for breakfast? |
| _____ | 6. Do you drink milk or cocoa for breakfast? |
| _____ | 7. How much milk or cocoa do you usually drink? |
| _____ | 8. Do you drink coffee for breakfast? |
| <u>0'clock</u> | 9. What time do you arise? |
| <u>0'clock</u> | 10. What time do you leave for school? |
| _____ | 11. Does your mother get your breakfast? |
| _____ | 12. Does an older sister get your breakfast? |

Always Sometimes Never

- | | | | |
|-------|-------|-------|---|
| _____ | _____ | _____ | 13. Do you get your own breakfast? |
| _____ | _____ | _____ | 14. Are you hungry about 10:00 A. M.? |
| _____ | _____ | _____ | 15. Do you eat a snack after school? |
| _____ | _____ | _____ | 16. Of what does this snack usually consist? |
| _____ | _____ | _____ | 17. Do you drink milk for supper? |
| _____ | _____ | _____ | 18. How much milk do you drink for supper? |
| _____ | _____ | _____ | 19. Do you have fruit for supper? |
| _____ | _____ | _____ | 20. What kind of fruit do you have for supper? |
| _____ | _____ | _____ | 21. Do you have a vegetable other than potatoes for supper? |
| _____ | _____ | _____ | 22. Do you eat anything before you go to bed? |
| _____ | _____ | _____ | 23. If you do, what do you usually eat? |
| _____ | _____ | _____ | 24. Do you go to bed about the same time every night? |
| _____ | _____ | _____ | 25. What time do you usually go to bed? |

O'clock

FORM II

Name of child _____ Grade _____
 Age _____ Sex _____
 Date _____

Record of Food Intake

Meal	Name of food	Amount
Breakfast		
Between breakfast and lunch		
Lunch		
Between lunch and supper		
Supper		
Before going to bed		

FORM III

Estimation of Probable Adequacy of Diet

Name	Age	Grade	
Food groups	Minimum frequency of daily use	Number of servings Oct. 14, 15, 16, 1952	Number of servings April 7, 8, 9, 1953
		T:W:T:Total	Ave.:Remarks
1. Leafy green vegetables:	1 or more servings		
Yellow vegetable			
2. Citrus fruit	1 or more servings		
Tomatoes			
Raw cabbage			
3. Potatoes	2 or more servings		
Other vegetables			
Other fruit			
4. Milk	1½ pints		
Cheese	milk		
Ice cream			
5. Meat, poultry	1 to 2 servings		
Eggs			
Fish			
Dried beans, peas			
6. Bread, enriched or whole grain	3 servings		
Cereal, enriched or whole grain			
7. Butter or fortified margarine	3 servings		

FORM IV
Food Preference Survey

Name _____ Grade _____

Sex _____ Date _____

Home: Farm _____ Town _____

Nationality of father: _____

Nationality of mother: _____

Occupation of father: _____

Directions: In the column to the left check yes or no to indicate whether or not you have eaten the food or food dish listed. In the columns on the right check whether you like, dislike, or have no particular feeling about the food or food dish.

Have Eaten		Reaction toward food			
Yes	No	Name of food or food dish	Like	Dislike	No particular feeling
:	:	Milk	:	:	:
:	:	Cocoa (hot)	:	:	:
:	:	Chocolate Milk (cold)	:	:	:
:	:	Cottage cheese	:	:	:
:	:	American cheese (yellow)	:	:	:
:	:	Macaroni and cheese	:	:	:
:	:	Toasted cheese sandwiches	:	:	:
:	:	Weiners	:	:	:
:	:	Hamburgers	:	:	:
:	:	Meat loaf	:	:	:
:	:	Spaghetti and hamburger	:	:	:
:	:	Meat turnovers	:	:	:
:	:	Chili	:	:	:
:	:	Ham loaf	:	:	:

:	:	:	:	:
:	:	Green beans	:	:
:	:	:	:	:
:	:	Yellow wax beans	:	:
:	:	:	:	:
:	:	Baked beans	:	:
:	:	:	:	:
:	:	Beans with ham	:	:
:	:	:	:	:
:	:	Boiled beans	:	:
:	:	:	:	:
:	:	Lima beans, buttered	:	:
:	:	:	:	:
:	:	Kidney bean salad	:	:
:	:	:	:	:
:	:	Peas, buttered	:	:
:	:	:	:	:
:	:	Creamed peas	:	:
:	:	:	:	:
:	:	Raw carrots	:	:
:	:	:	:	:
:	:	Buttered carrots	:	:
:	:	:	:	:
:	:	Creamed carrots	:	:
:	:	:	:	:
:	:	Corn	:	:
:	:	:	:	:
:	:	Spinach	:	:
:	:	:	:	:
:	:	Raw tomatoes	:	:
:	:	:	:	:
:	:	Canned tomatoes (cold)	:	:
:	:	:	:	:
:	:	Canned tomatoes (hot)	:	:
:	:	:	:	:
:	:	Lettuce salad	:	:
:	:	:	:	:
:	:	Lettuce carrot salad	:	:
:	:	:	:	:
:	:	Cabbage salad	:	:
:	:	:	:	:
:	:	Cabbage-carrot-celery salad:	:	:
:	:	:	:	:
:	:	Celery sticks	:	:
:	:	:	:	:
:	:	Mashed potatoes	:	:
:	:	:	:	:
:	:	Creamed celery	:	:
:	:	:	:	:
:	:	Baked potatoes	:	:
:	:	:	:	:
:	:	Boiled potatoes	:	:

:	:	:	:	:
:	:	Boston brown bread	:	:
:	:	Liver	:	:
:	:	Peanut butter sandwiches	:	:
:	:	Baking powder biscuits	:	:
:	:	Chocolate pudding	:	:
:	:	Butterscotch pudding	:	:
:	:	Rice pudding	:	:
:	:	Tapioca	:	:

Table 9. Weight-height records of the 45 subjects.

			Fall records			Spring records		
Subject	Sex	Age	Height	Weight		Age	Height	Weight
R. B.	M	6	44	40		7	46	45
M. N.	M	6	48	53		7	49	57
K. R.	F	5	48	48		6	50	58
A. D.	M	7	50	55		8	50 $\frac{1}{2}$	62
W. H.	M	6	46	50		7	48	58
D. K.	M	7	46	53		8	47	60
A. M.	F	7	50 $\frac{1}{2}$	62		8	53	74
E. N.	F	6	44	46		7	46	52
C. S.	M	7	44	50		8	50	55
J. D.	F	8	48	44		9	50	50
P. D.	F	7	48	46		8	50	55
S. G.	F	7	50	48		8	52	54
D. R.	M	7	48	59		8	49	68
R. S.	M	7	49 $\frac{1}{2}$	51		8	51	58
J. T.	M	8	52 $\frac{1}{2}$	64		9	54	74
D. A.	F	8	53	70		9	55	77
V. B.	F	8	52	64		9	53	75
N. R.	F	8	54 $\frac{1}{2}$	60		9	56	68
D. T.	F	9	52	58		10	54	65
L. L.	M	10	55	71		11	57	78
L. S.	F	10	51	70		10	54	72
M. A.	F	11	57	79		12	59 $\frac{1}{2}$	91
K. R.	M	11	57	72		11	59	79
W. S.	F	11	59	78		12	61	87
B. T.	M	11	57	76		11	57	95
K. B.	M	12	54	65		12	59	68
R. F.	F	13	63	99		13	63	104
N. L.	F	13	64 $\frac{1}{2}$	94		13	64 $\frac{1}{2}$	99
L. C.	M	13	59 $\frac{1}{2}$	96		14	61	105
G. F.	M	13	62	90		13	63 $\frac{1}{2}$	97
E. H.	M	14	61 $\frac{1}{2}$	93		15	64	112
M. L.	F	13	62	103		14	63 $\frac{1}{2}$	104
W. M.	F	13	64 $\frac{1}{2}$	128		14	65 $\frac{1}{4}$	139
P. T.	F	12	56	73		13	58	83
L. B.	M	13	55	72		14	56	76
G. D.	F	14	63	112		15	64 $\frac{1}{2}$	115
L. N.	M	14	54	68		15	55	72
C. B.	F	15	62	120		16	63 $\frac{1}{2}$	122
A. D.	F	15	60 $\frac{1}{2}$	130		16	68	136
A. H.	F	15	67	128		16	68	131
J. M.	M	15	74	172		15	74	175
L. D.	F	15	62 $\frac{1}{2}$	112		16	63	115
M. N.	M	16	65	124		16	66	130
H. B.	M	17	69	150		17	69	150
L. S.	F	16	64	142		17	64 $\frac{1}{2}$	144

Table 10. Sample of menu sheet sent weekly to mothers.

Monday, March 2 (planned by Florena Schamber)

Pigs-in-blankets
Escalloped corn
Lime jello vegetable salad
Bread and butter sandwiches
Butterscotch-coconut pudding
Milk

Tuesday, March 3

Turkey salad
Mashed potatoes
Creamed peas
Bread and butter sandwiches
Peaches
Milk

Wednesday, March 4 (planned by Wayne Newell)

Hamburger and spaghetti
Boiled potatoes
Lettuce salad
Bread and butter sandwiches
Jello fruit salad
Milk

Thursday, March 5 (Planned by Leo Paul Comeau)

Baked ham
Potato salad
Celery-carrot-cabbage salad
Bread and butter sandwiches
Peanut butter cookies
Milk

Friday, March 6

Mackerel salad
Macaroni and cheese
Green beans
All bran raisin muffins with honey
Fruit cup
Milk

IMPROVEMENT OF THE DIETS OF ELEMENTARY AND SECONDARY SCHOOL
CHILDREN THROUGH NUTRITION EDUCATION
AND THE SCHOOL LUNCH PROGRAM

by

SISTER MARY AMBROSE KELLEY
B. S., Marymount College, 1945

AN ABSTRACT OF A THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Foods and Nutrition

KANSAS STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE

1953

ABSTRACT

The purpose of this study was to try to improve the diets of elementary and secondary school children through nutrition education and the school lunch program. Readings in the literature indicated that previous work to improve diets had been accomplished through these same channels. A consolidated school in Rooks County, Kansas was chosen for study. There were 184 children enrolled and 173 of these participated in the type A plate lunch which was served. In order to get an overall picture of this community's dietary pattern one child from each of the 60 families represented was chosen for study. Forty-five school lunch pupils from grades one through 12, ranging in age from five to 17 years, actually participated because only these had records for both fall and spring.

A study of the children's initial food habits at home showed that many of the children had poor dietary habits. Only two-thirds of them always ate breakfast, and one-sixth never drank milk. One-fourth of the subjects reported that they never ate fruit for breakfast, and only one-half always ate a vegetable other than potato at the evening meal. After-school snacks were eaten by two-thirds of the subjects; approximately one-fifth of the subjects ate before going to bed.

A food preference survey given in the fall indicated that fruits rated high among foods liked, and vegetables rated high among foods disliked or foods not eaten. Of the 74 foods listed, 64 were disliked, and 51 had not been eaten by one or more subjects.

Three-day dietary records taken in both fall and spring indicated that diets of many subjects were low in milk, leafy green or yellow vegetables, and vitamin C-rich foods. Although the average daily intake of vitamin C-rich foods increased from fall to spring, only one-half of the subjects in the spring were eating one serving or more daily. In both fall and spring, three-fourths of the children consumed daily less than three cups of milk, less than one serving of leafy green or yellow vegetables, and less than three servings of butter or fortified margarine. The average daily intake of meat or other protein-rich foods was approximately three servings or about two to three times the recommended amount. Bread and other cereal products were eaten in large amounts by most of the subjects.

Although type A lunches were planned and served, this did not insure that every child always took all the food provided, particularly the milk and vegetables. Indifferent attitudes of student servers probably affected the acceptance of some foods.

Daily records kept by each classroom teacher showed that the number of children taking milk with the school lunch decreased from fall to spring. One hundred per cent of the children in grades seven and eight consumed milk with the school lunch throughout the nine month period; but in the other five rooms the per cent of children who drank milk fluctuated from 14 to 92.

For these 45 subjects, as a group, there was no obvious relationship between eating habits and pattern of growth as

determined by plotting height and weight measurements on the Wetzell Grid. In the fall five-sixths of the subjects had good growth and slightly more than one-half had good body build, but more subjects were of thin build than were of stocky build. Although eating habits were poor for all age groups the effects of such habits on individual growth patterns were most apparent in the 12-14 year age group where rapid growth was occurring.

A nutrition education program was directed toward both students and parents. Student nutrition education was developed in grades seven through 12 and consisted of studies in nutrition, menu-planning contests, poster contests, a good and poor breakfast exhibit, and an animal feeding experiment. Parent education emphasized the children's dietary needs and means to improve their eating habits. Mothers were assembled after Parent-Teacher Association meetings for formal discussions; literature was distributed and explained, and ideas were exchanged. Each mother also received in advance a copy of the weekly lunch menus which frequently included a recipe and sometimes a nutritional "pep talk".

The children's acceptance of certain foods on the school lunch which they had previously disliked or not eaten indicated that the school lunch program did change eating habits. Although consumption of vitamin C-rich foods did increase during the year, other dietary habits were apparently unaffected by the nutrition education program. Both children and parents showed a definite interest in this nutrition education program, but the results could not be measured adequately at the end of only an eight-month period.